



**US Army Corps
of Engineers**

DCAF Bulletin

Design Construction Analysis Feedback

No. 97-11 Issuing Office: CEMP-CE Issue Date: 5 SEP 97 Exp. Date: 31 DEC 00

CEMP-C

Subject: Ten Most Common Masonry Deficiencies

Applicability: Information

Reference: CEGS 04200, Masonry

Masonry construction is the most common system for construction of permanent military facilities. It is very flexible from a design perspective and is easily adapted for seismic considerations. However there is no other system that exhibits such a wide variance in quality. The problems originate in both the design and construction phases, and usually result from a lack of understanding of the detailed requirements. The following masonry deficiencies have been gleaned from several years of Design Construction Evaluations. They are not necessarily the most serious deficiencies, but they are the most repetitive. The paragraph numbers refer to the Corps of Engineers Guide Specifications (CEGS) referenced above.

1. Control joints are essentially man made cracks in masonry walls. Those that are not adequately designed and constructed can cause random cracking problems in the basic wall structure and reflection cracking of both the interior wall and the exterior veneer. (Paragraph 3.14). Some of the deficiencies related to control joints are:

- a. Failure to provide details and locate the control joints on the contract drawings.
- b. Omission of the joints as detailed on the contract drawings.
- c. Not raking mortar out of the control joint and replacing with caulking.
- d. Failure of the mason to extend the control joint to the slab or the footing.
- e. Failure to locate control joints at changes in wall thickness, changes in wall height, at wall openings etc.
- f. Not using special masonry units for control joints (i.e., sash blocks, jamb blocks, stretcher blocks, etc.).

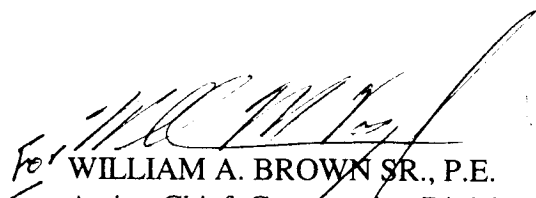
2. Sample masonry panels are not being constructed as specified. They are incomplete and do not represent all of the wall elements required by the contract. In some cases the guide specifications have been over-edited to the point where the sample panel is very rudimentary and does not provide a standard for correct wall construction (Paragraph 1.3).
3. Reinforced masonry is not being constructed IAW the specifications. Also, in some cases seismic reinforcing is not designed in the walls even in seismic zones. Bar positioners are not used for vertical reinforcement and lap splices are not of sufficient length to develop the strength of the reinforcement (Paragraph 3.10).
4. The tops of unfinished walls are not protected from weather at the end of the shift. This results in water entering the walls, and is a major cause of efflorescence problems. This saturation of the masonry units has a detrimental effect on the strength of the grout that is used to fill the cells in a reinforced wall. (Paragraph 3.25).
5. Mortar droppings in the space between the wythes of a cavity wall will plug the weep holes and cause moisture to accumulate in the cavity wall. Also failure to remove excess mortar that protrudes more than a half inch into a space or cell to be grouted and reinforced reduces the strength of the reinforced cell. (Paragraph 3.2).
6. Masonry units stored on site are not adequately covered, protected from weather, and stored above the ground to control the moisture content. Cementitious materials are even more susceptible to weather and moisture damage and must be stored in a more weather tight environment. (Paragraph 1.4).
7. Reinforced cells and bond beams are not properly grouted. Grout is being omitted in some cases. Mortar is being used instead of grout. (Paragraph 2.11).
8. Masonry exhibits poor quality workmanship. Bed joints and head joints are not level, or plumb, and do not hold bond. Units are out of plumb with the wall surface. Joints are not consistent in width. Joints are tooled when the mortar is too wet. Footings are not adequately cleaned before masonry is laid on them. (Paragraphs 3.2 through 3.2.12).
9. The inner wythe of a cavity wall is being laid too far ahead of the exterior wythe. This is only allowed when adjustable joint assemblies (pintel & eye) are specified. The purpose of bringing the wythes up together is to keep the joint reinforcement and the wall flashing from being exposed and damaged. (Paragraph 3.3).
10. The mason does not provide a full head joint when laying the masonry unit. This is a common practice and should not be allowed. Unless the head joint is fully buttered, the joint will develop cracks during curing. This allows water to enter the wall, and is a major factor in efflorescence. (Paragraph 3.2).

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SUBJECT: Masonry Deficiencies

The use of a properly designed and constructed sample panel is probably the best way to avoid repetitive deficiencies. The designer should carefully evaluate the amount and complexity of the masonry construction when the requirements for the sample masonry panel are specified. Also, a detailed Preparatory Phase Inspection is critical prior to any masonry construction, followed shortly by construction of the sample panel. Inspection and acceptance of the sample panel serves as the Initial Phase Inspection. All deficiencies noted during this inspection must be corrected prior to any masonry construction on the facility itself.

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